XI

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EXAMINER	
LU, TOM Y	
ART UNIT	**PAPER NUMBER**
2621	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/786,173	LAURENT-CHATENET ET AL.	
	Examiner	Art Unit	
	Tom Y Lu	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 August 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,9,10 and 12-23* is/are rejected.

7)☒ Claim(s) *7,8 and 11* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment and written response filed on August 25, 2004 has been entered.

2. Claims 1-23 have been amended.

3. Claims 1-23 are pending.

Response to Arguments

4. Applicant's arguments, see Remarks, pages 15-16, filed on 8/25/2004, with respect to the rejection(s)of claim(s) 1 under 35 U.S.C. 102(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Yokoyama (U.S. Patent No. 5,751,365) and Szeliski ("Motion Estimation with Quadtree Splines", IEEE transactions on pattern analysis and machine intelligence, vol. 18, NO. 12, December 1996).

5. Upon further review of specification and in light of applicant's arguments, 35 U.S.C. 112 2nd paragraph rejection of Claim 18 is withdrawn.

6. The indicated allowability of claim 15 is withdrawn in view of the newly discovered reference(s) to Takahashi (U.S. Patent No. 5,396,437). Rejections based on the newly cited reference(s) follow.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-6, 9-10 and 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokoyama (U.S. Patent No. 5,751,365) and in view of Szeliski ("Motion Estimation with Quadtree Splines", IEEE transactions on pattern analysis and machine intelligence, vol. 18, NO. 12, December 1996).

a. Referring to Claim 1, Yokoyama discloses (a) defining an initial model of finished elements, the model comprising a mesh having nodes that are points of the image I_2 (see figure 2A for the mesh for image I_2 and the nodes), a movement vector associated with each node of the mesh, and an interpolation formula for calculating the value of the movement vector of each point of the image I_2 from the values of the movement vectors of the nodes of the mesh to which the image I_2 belongs (column 7, lines 66-67 and column 8, lines 1-2, the motion vector of the image I_2 are calculated interpolatively), (b) globally optimizing the values of all the movement vectors of the initial model or a final model according to a differential method (the block matching algorithm at column 7, line 20 or the affine transformation at column 8, line 9 both can globally optimize the movement vectors, and they both are differential methods), (c) calculating a variation E between the image $\hat{I}_2$ and the image I_2 for each finished element or mesh (see equation 4 for Err, and the current frame $C(x, y)$ is the image I_2 and the $P(x+v_x, y+v_y)$ is the image $\hat{I}_2$), (d) carrying out a finer meshing on a discrete fraction of all the finished elements determined according to a criterion relating to the variation E and allocating a movement vector to each new mesh node to define the final model of finished elements (column 10, lines 44-47, the repartition is performed if the

improvement degree is equal to or larger than a predetermined threshold value. Note the repartitioning herein means adding new nodes as shown in figure 2B, and such repartitioning is associated with prediction error *Err*). However, Yokoyama does not explicitly teach such repartitioning is performed iteratively. Szeliski teaches (e) repeating steps (b), (c) and (d) on the final model of finished elements obtained at the end of the preceding step (d) until a stoppage criterion is satisfied (see figure 8 in Szeliski). At the time the invention was made, a person of ordinary skilled in the art would have been motivated to repeat steps (b), (c), and (d) in Yokoyama as taught by Szeliski because Szeliski teaches repeating the steps (b), (c) and (d) as taught by Yokoyama can minimize the prediction error as shown in experimental results section 8, page 1207, additionally, Yokoyama at column 11, lines 46-50, teaches the various changes to improve the system is welcomed.

b. Referring to Claim 2, the combination of Yokoyama and Szeliski teaches wherein the finished elements are classified a decreasing order of the variation E of each finished element and X first finished elements of the classification are subdivided into smaller finished elements to carry out a finer meshing on a discrete fraction of the finished elements in step (d), wherein X represents a predetermined fraction of the number of finished elements in the model (see figure 2B in Yokoyama).

c. Referring to Claim 3, the combination of Yokoyama and Szeliski teaches wherein to carry out a finer meshing on a discrete fraction of the finished elements in step (d), the variation E calculated in step (c), for each finished element is compared with a threshold variation that depends on a size of the finished element in question, and each of the

finished elements having a variation E greater than the threshold variation is subdivided into smaller finished elements (column 10, lines 44-47 in Yokoyama, and page 1205, right column, lines 40-46 in Szeliski).

d. Referring to Claim 4, the combination of Yokoyama and Szeliski teaches wherein the stoppage criterion comprises a predetermined number of finished elements constituting the model of finished elements defined by step (d) (Yokoyama: column 11, lines 6-10).

e. Referring to Claim 5, the combination of Yokoyama and Szeliski teaches wherein the stoppage criterion is satisfied when the variations E of the finished elements defined by step (d) are smaller than a functional threshold variation that depends on a size of the finished elements in question (Szeliski: because the nodal representation as shown in figure 7 shows coarse to fine, the variations E of the set of finished elements of the model obtained at the end of the preceding (d) must be smaller than a functional threshold variation which depends on the size of the finished elements in question).

f. Referring to Claim 6, the combination of Yokoyama and Szeliski teaches wherein for each numerical image I_1 and I_2, a set of R images I_i^r with a level of resolution r and luminance Y_i^r is defined, with r taking the values (0,...R-1) and i taking the values 1 and 2 is defined, the images I_1^0 and I_2^0 corresponding to the numerical images I_1 and I_2, and in that the steps (b) to (e) are carried out for each resolution level r from the level r=R-1 to the level r=0 (see figure 7 in Szeliski).

g. Referring to Claim 9, the combination of Yokoyama and Szeliski teaches wherein the movement vectors are nil vectors when the initial model is defined (in any model, the initial model will be nil vectors because the values are brought in by the images).

h. Referring Claim 10, see equation 4 in Yokoyama.

i. Referring to Claim 19, the combination of Yokoyama and Szeliski teaches wherein the meshing carried out on the discrete fraction of the finished element, in step (d) is associated with a partially quaternary tree in which each level represents a meshing level and each node represents a triangle of the given level, and wherein a binary train describing the tree is generated for coding the images (see figure 7 in Szeliski for meshing level, and see figure 2B in Yokoyama for triangles, and the binary train describing the tree is an inherent feature in Szeliski since it is an hierarchical structure coding system).

j. Referring to Claim 20, the combination of Yokoyama and Szeliski teaches wherein the movement vectors associated with each node of the tree are encoded differentially with respect to the movement vectors of a father node when the father node exists, and wherein the movement vectors are ordered in the binary train along a width passage of the tree (all of these are inherent hierarchal encoding as seen in figure 8 in Szeliski).

k. Referring to Claim 21, the combination of Yokoyama and Szeliski teaches wherein the meshing carried out on the discrete fraction of the finished elements in step (d) is associated with a partially quaternary tree in which each level represents a meshing level and each node represents a triangle of the given level, and wherein the tree is

generated from a binary train of encoded data describing the tree for decoding the images (see explanation in Claim 19, and for every receiving end, there is decoder for decoding the binary train to restore the image).

l. Referring to Claim 22, the combination of Yokoyama and Szeliski teaches wherein the encoded data relating to a given level of the tree is collectively regrouped in the binary train to generate the tree level by level as the binary train is read (it is inherency in hierarchical structure encoding).

m. Referring to Claim 23, the combination of Yokoyama and Szeliski teaches wherein at least one of range belongs to a group consisting of the following ranges: compression of sequences of image, and compression of data in spaces larger than 2 (both Yokoyama and Szeliski teaches it is in video compression environment).

8. Claims 12-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokoyama and Szeliski as applied to claim 1 above, and further in view of Takahashi et al (U.S. Patent No. 5,396,437).

a. The combination of Yokoyama and Szeliski does not explicitly teach the differential method for optimizing the movement vector is Gauss-Newton method. Yokoyama teaches the movement vectors are calculated interpolatively at column 7, lines 66-67. Takahashi at column 4, lines 20-25, teaches the interpolation method can be carried out by various techniques one of them is Gauss-Newton. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to use Gauss-Newton method to optimize the movement

vectors because it is merely one of many alternative techniques for mathematical calculation.

b. With regard to Claim 13, Marquardt extension of the Gauss-Newton method is just another alternative mathematical optimization calculation that a person of ordinary skilled in the art would be motivated to adapt.

c. With regard to Claim 14, the compactness constraint is an inherently feature when applying Lagrangian technique for optimization, which is taught in Takahashi, and the motivation for using Lagrange interpolation technique for movement vector calculation is the same as Claim 13.

d. With regard to Claim 15, the equation is Lagrange interpolation equation.

e. With regard to Claim 16, see explanation in Claim 14.

f. With regard to Claim 17, see explanation in Claim 14.

g. With regard to Claim 18, the use of an LDL profile technique is just another alternative mathematical optimization calculation that a person of ordinary skilled in the art would be motivated to adapt.

Allowable Subject Matter

9. Claims 7, 8 and 11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Claims 7, 8 and 11 incorporate equations, which are not taught or suggested by the art of record.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Laurent et al, "Limitation of Triangles Overlapping In Mesh-Based Motion Estimation Using Augmented Lagranaina", IEEE 1998.

b. O'Connell et al, U.S. Patent No. 5,537,155, see figure 4.

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tom Y Lu whose telephone number is (703) 306-4057. The examiner can normally be reached on 8:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H Boudreau can be reached on (703) 305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PRIMARY EXAMINER

Tom Y. Lu